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METEOROLOGICAL OFFICE
CLIMATOLOGICAL MEMORANDUM No. 32

SURFACE WINDS OVER IRELAND ON SATURDAY, 16th SEPTEMBER 1961

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INTRODUCTION

1. During Saturday, 16th September 1961, a small and vigorous depression passed north-north-east close to the western seaboard of Ireland, bringing with it winds considerably exceeding gale force. In press reports and elsewhere at the time this depression was colloquially known as "Hurricane DEBBIE", although it was not a 'hurricane' in the proper (tropical) sense, despite the fact that maximum gusts at some places reached 'hurricane force' within the Beaufort wind scale.
2. Fig.1 shows the tract of the depression, with the position of its centre marked at 3-hourly intervals between midnight (00h.) and 21h. G.M.T. on that date. Fig.2 shows the pressure distribution over Ireland at midday (12h. G.M.T.), with isobars drawn at 2 mb. intervals.

WIND DATA RECORDED

3. Details of wind direction and speed were recorded on anemographs at 18 locations in Ireland, and, in addition, observations at each hour of wind speed and direction from a cup-generator anemometer were available for most of the day from an auxiliary station.
4. Details of the anemographs and their respective sites are given in Table I

HOURLY WIND DATA

6. Table II gives the hour-by-hour direction and speed of the wind during the day at each of the stations. The method of determining "mean speed" and "mean direction" from anemograph records differs between the United Kingdom and Irish Meteorological Services:-

(a) U.K. Meteorological Office

Means of speed and direction are taken over 60-minute periods ending at the exact hour (GMT), speed measured to the nearest 1 kt., and direction to the nearest 10° (from true North);

(b) Irish Meteorological Service

Means of speed and direction are taken over 10-minute periods ending at the exact hour (GMT), speed measured to the nearest 1 kt., and direction to the nearest 5° (from true North).



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7. In addition to the above standard tabulations, the following additional data were extracted from the anemograph traces:

- (a) the maximum gust (to the nearest 1 kt.) in each of the 60-minute periods ending at the exact hour,
- (b) the highest mean wind speed recorded, with its direction, over any 10 minutes during the day,
- (c) the highest mean wind speed, with its direction, over any 60 minutes during the day,
- (d) the maximum gust during the day with its direction and time (GMT),
- (e) for stations in Northern Ireland and for those within adjacent counties within the Republic, notes on gusts, etc. are given in a "Remarks" column.

GENERAL ASSESSMENT

8. In an attempt to present an overall picture for Ireland, isotachs of maximum gust and of maximum mean wind speed over any 60 minutes have been drawn:

Fig.3 shows the isotachs of the maximum gust as recorded by the anemographs at each of the 19 stations - the speed of the gust (in knots) being plotted within a circle representing the station,

Fig.4 shows the isotachs of maximum mean wind speed over a period of any 60 minutes (see also para.13).

9. It will be seen that the highest wind speeds were recorded in a band, running S.S.W. - N.N.E. between Valentia and Malin Head, with the strongest winds at the northern end. (Lighter winds, as indicated by the data from Belmullet and Glenmoy on the coast of Co. Mayo, were experienced very near to the centre of the depression.) The isotachs are dotted over southern Co. Down because the eye observations of the dials at Kilkeel cannot be treated in the same manner as data recorded on charts.

10. On the reliability of Fig.3, it is considered that the amount of basic data shown and their mutual consistency are such that Fig.3 can be taken to give a reasonable approximation to the true picture. Its interpretation for any given locality is subject to the remarks in paragraph 12 below.

11. In the conditions prevailing at the time, the possibility of the maximum gust being close to the maximum gradient wind was considered to be worthy of examination. The isobaric charts at 3-hourly intervals were examined at nine suitably chosen fixed points over Ireland and the maximum geostrophic wind noted. Utilising Gilbert's ⁽¹⁾ formula and his tables published in the "Handbook of Weather Forecasting" ⁽²⁾, the percentage correction to the geostrophic wind to obtain the gradient wind was found. From this the probable maximum gradient wind speed was computed and plotted for the nine points, and from these values isotachs were drawn (Fig.5). It will be seen that over much of Ireland the relationship between Fig.5 and Fig.3 is very close. This comparison between Figs. 3 and 5 is interesting and suggests that estimates of the maximum gust likely to be experienced in such conditions at sites not subject to the limitations below could possibly be made from synoptic charts, if anemograph data are not available.

LIMITATIONS

12. In utilising the data in this paper, particularly if interpolation from the maps (Figs. 3 or 4) is carried out, it should be appreciated that local topography would appreciably affect maximum wind speeds. None of the anemographs are at a very high altitude above sea level, so that the isotachs must

be considered as being applicable only to relatively low level areas. In addition, hills, particularly marked ranges of hills at right-angles to the wind direction, would reduce wind speed for a distance on their leeward side. Conversely, valleys running parallel with the wind direction could be subject to "funnelling" effects, producing increased speeds. In built-up areas the general turbulence and eddies around buildings would affect the flow of wind, and the values given in this report cannot be considered as being representative. Generally speaking, however, mean wind speeds in such areas would have been appreciably lower than those indicated in Fig.4, whilst maximum gust speeds may not have fallen far short of those indicated in Fig.3 (i.e. the gustiness factor in built-up areas would be greater). It should be noted that the anemographs whose data were used in this paper were exposed to the wind under as near standard conditions as practicable (see site details, Table I).

13. In drawing fig.4, the values as recorded at Coolkeeragh and Nutts Corner have largely been ignored because they are too low to fit the general pattern. This apparent anomaly is being investigated further.

ACKNOWLEDGEMENTS

14. I would like to acknowledge the assistance given by the Director of the Meteorological Service of the Republic of Ireland in making available tabulated data and copies of certain anemographs, which have been used in this paper.

15. Also, I should like to thank Messrs.Carbide Industries Ltd. for the use of their Coolkeeragh record, and the General Manager, Belfast Harbour Commission, for the use of the Belfast Harbour record.

REFERENCES

- (1) GILBERT, G.H. "Note on graphical methods for determining the curvature correction to the geostrophic scale", S.T.D.M., London, No.98, 1945.
- (2) BRADBURY, N. "Handbook of Weather Forecasting" (chapter 13, pp.11-13), M.O.(R) 637, Met.Off., London, 1960 (Restricted publication).

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NOTE: This paper, in a slightly different form, was first issued as a "domestic memorandum" by M.O.Belfast when answering inquiries concerning the winds of 16th September 1961.

ANEMOGRAPH SITE DETAILS

Station	Irish Grid	Lat.	Long.	Height			Type of anemograph
				Site asl	Head ag	Effective Height	
		North	West	ft.	ft.	ft.	
<u>Six Counties</u>							
ALDERGROVE	iJ.145801	54°39'	6°13'	216	65	55	P.T.A.
BALLYKELLY	iC.624235	55°04'	7°01'	2	50	35	P.T.A.
BELFAST HARBOUR	iJ.362769	54°37'	5°53'	10	47	--	N&Z An. (PT)
COOLKEERAGH	iC.483223	55°02'	7°15'	0	42	--	Munro CG
NUTTS CORNER	iJ.196776	54°38'	6°09'	314	31	31	MO.Elect.(CG)
KILKEEL	iJ.315140	54°04'	5°57'	60	40	--	CG (not an anemograph)
<u>Republic</u>							
BELMULLET	iF.6932 *	54°14'	10°00'	29	40	30	P.T.A.
BIRR	iN.0706 *	53°06'	7°54'	232	40	30	P.T.A.
CLAREMORRIS	iM.3574 *	53°42'	8°59'	225	40	28	P.T.A.
CLONES	iH.5026 *	54°11'	7°14'	289	40	28	P.T.A.
DUBLIN AIRPORT	iO.2744 *	53°26'	6°15'	213	40	32	P.T.A.
GLENAMOY	iF.8833 *	54°14'	9°43'	73	40	32	P.T.A.
KILKENNY	iS.4957 *	52°40'	7°16'	207	40	30	P.T.A.
MALIN HEAD	iC.4158 *	55°22'	7°20'	80	40	30	P.T.A.
MULLINGAR	iN.4353 *	53°31'	7°21'	357	40	28	P.T.A.
ROCHE'S POINT	iW.8361 *	51°48'	8°15'	133	40	30	P.T.A.
ROSSLARE	iT.1312 *	52°15'	6°20'	78	40	28	P.T.A.
SHANNON AIRPORT	iR.3861 *	52°41'	8°55'	25	40	32	P.T.A.
VALENTIA OBSY.	iV.4378 *	51°56'	10°15'	55	41	33	P.T.A.

asl = above sea level

ag = above ground

P.T.A = Pressure-tube anemograph ("Dines" pattern)

N&Z An(PT) = Negretti & Zambra anemobiograph (pressure tube system)

Munro CG = Cup-generator anemograph (speed only), by Messrs.R.W.Munro, & Co.Ltd.

CG = Cup-generator anemometer (not anemograph) - at Kilkeel.

MO.Elect.CG = Met.Office pattern, cup-generator, electrical, including direction.

* The Irish Grid reference of stations in the Republic of Ireland is very approximate, and is shown only to the two figures "easting" and "northing".

TABLE II

B A L L Y K E L L Y

A L D E R G R O V E

60-minute period ended at (GMT)	Mean over hour o kt.	Max. Gust kt.	Remarks on gusts, &c.	Mean over hour o kt.	Max. Gust kt.	Remarks on gusts, &c.	(GMT)
0100	110	18	Between 1200 and 1600 gusts of 65kt. or more occurred frequently, and between 1300 and 1600 they exceeded 70kt. at roughly $\frac{1}{4}$ -hour intervals. Gust 75 kt. at 1320 GMT; gust 76kt. at 1545 GMT; gust 67kt. 1630 GMT. Between 1600 and 1700 the gust level was consistent at 60 kt. (save for isolated gust mentioned above, to 67kt.).	040	5	From light and variable, wind became 1400 at 0420 GMT. Sudden rise in mean from 16kt. to 26kt. 0625-0635 GMT. Sudden rise in mean from 28kt. to around 45kt. at 1140 GMT (gusts to 70kt.). Gust 89 kt. 1240 GMT; 82kt. at 1340 GMT; 86kt. 1425 GMT; 92kt. at 1525 GMT; 75kt. 1620 GMT; 49kt. 1935 GMT.	0100
0200	140	25		030	9		0200
0300	150	30		020	9		0300
0400	150	32		---	2		0400
0500	150	35		140	21		0500
0600	140	31		130	25		0600
0700	130	37		140	42		0700
0800	140	42		130	29		0800
0900	140	39		140	40		0900
1000	150	52		140	45		1000
1100	160	60	The "swing" of the direction pen was consistent throughout the day without any significant changes with the higher gusts, generally $\pm 20^\circ$ from the mean direction.	160	53	From 1140 to 1620 GMT frequent gusts to 70kt. and over, and from 1300-1500 GMT to over 75 kt. From 1900-2000 GMT general gust level 42kt. save isolated 49kt.	1100
1200	170	63		170	75		1200
1300	170	69		180	89		1300
1400	180	75		190	82		1400
1500	190	73		190	86		1500
1600	190	76		200	92		1600
1700	200	67		210	75		1700
1800	200	61		220	68	The "swing" of the direction pen between 0600 and 1000 GMT was generally $+25^\circ$, but between 1000 and 1700 GMT this increased to $+35^\circ$ from the mean. It returned to $+25^\circ$ after 1700 GMT.	1800
1900	210	55		220	56		1900
2000	200	47		220	49		2000
2100	200	42		210	34		2100
2200	200	36		210	36		2200
2300	190	32		210	37		2300
2400	190	29		210	31		2400
Max. Mean over any 60 min. over any 10 min.	49 51			51 52			

TABLE II
contd.

BELFAST HARBOUR

COOLKEERAGH

60-minute period ended at (GMT)	Mean over hour o kt.	Max. Gust kt.	Remarks on gusts, &c.	Mean over hour o kt.	Max. Gust kt.	Remarks on gusts, &c.	(GMT)
0100	---	0	N.B. Direction converted from compass points to degrees, speeds converted from miles per hour to knots, and times converted from clock time (BST) to G.M.T. Directions (BST) to G.M.T. Directions marked with asterisk are probably reliable, though there was some sticking of the vane at "southwest". Minor squall to 36kt. at 0525 GMT. Increase in mean speed from 23kt. to 35kt. at 1135 GMT. Frequent gusts to 53kt. or more between 1400 and 1600 GMT. Minor squall to 57kt. at 1710 GMT.	---	--	N.B. Direction not recorded.	0100
0200	190	18		7	13	Speeds converted from miles	0200
0300	180	27		10	16	per hour to knots, and times	0300
0400	180	30		10	17	converted from clock time (BST)	0400
0500	180	26		6	11	to G.M.T.	0500
0600	180	36		5	10	Data for hours ending 0100, 2100	0600
0700	160	23		9	16	and 2200 GMT not available, the	0700
0800	150	27		10	22	latter two because of a break in	0800
0900	170	35		13	27	the strip-chart.	0900
1000	170	43		14	29		1000
1100	180	46		27	60	Mean increased from 11kt. to 29kt.	1100
1200	190	53		30	65	0930-1015 GMT. Gusts (times in	1200
1300	200	53		30	69	brackets):	1300
1400	200	61		37	83	43+ (from 1005); 53 (1140); 60(1150)	1400
1500	220#	63		40	91	63(1120); 65(1145); Frequent 60+;	1500
1600	220#	57		43	83	67(1205); 69(1255); Frequent 75-78;	1600
1700	220#	52		42	81	83(1303); 82(1305); 76+ (from 1430)	1700
1800	220#	57		37	70	91(1455); 80(at times 1500-1600);	1800
1900	230#	43		31	56	83(1530); 81(1603); 70-75(1600-1700)	1900
2000	240#	38		27	42	70(1703); Gusts dying 65 to 47	2000
2100	230#	34		--	--	(1700-1800); Generally 40-48 (1800-	2100
2200	230#	28		--	--	1900), isolated 56(1807). Generally	2200
2300	220#	23		21	36	35-40 dying to 33-35 (1900-2000).	2300
2400	220#	23		20	35	30-35 (2200-2300); 25-35 (2300-2400)	2400
Max. Mean over any 60 min. over any 10 min.	42 47			(45) 49		(see para. 13 of main text)	

TABLE II

contd.

NUTTS CORNER AIRPORT

KILKEEL

60-minute period ended at (GMT)	Mean over hour o kt.	Max. Gust kt.	Remarks on gusts, &c.	Mean o kt.	kt.	(GMT)
0100	150	18	N.B. An electricity power failure between 1630 and 1700 (approx.) resulted in a loss of record during that period. The mean values have been estimated, and the max. gust that was recorded on the chart for the 60-minutes ending at 1700 GMT is shown from the "overprinting" on the chart.	160	4	0001
0200	160	24		160	22	0100
0300	170	29		180	25	0200
0400	170	28				0300
0500	170	29	At 0900 increase in mean from 23kt. (gusts 32-35kt) to 30kt (gusts 40kt). Thereafter gust values steadily increased to 5-49kt by 1100 GMT. Between 1100 and 1130 they further increased from 50kt. to 60kt, but died off, with decreased mean speed to 1200 GMT (mean 26kt., gusts to 30kt.), but this lull was very short lived (about 5 minutes) and gust values rose again to 50+kt, and to 60+kt. by 1215 GMT. Gusts reached or exceeded 60kt. regularly between 1215 and 1540 GMT and 60 kt. was reached between 1630 and 1700 (see N.B. above). Thereafter wind steadily moderated, gusts generally to around 40 kt. until 1910 GMT (save for a short period 1800-1810 GMT when they reached 50-58 kt.). After 1910 GMT gusts to around 30 kt., decreasing steadily towards midnight. The "swing" of the direction pend was around +15° from the mean at first, but this increased to +30° during the gale force winds. Gusts 61kt. at 1130; 66kt at 1220; 69kt. at 1340.			0400
0600	160	27				0500
0700	150	37		160	26	0600
0800	160	39		160	24	0700
0900	160	35		160	30	0800
1000	170	49		180	32	0900
1100	180	47		180	38	1000
1200	190	61		200	40	1100
1300	200	66		200	44	1200
1400	200	69		200	48	1300
1500	210	63		200	50	1400
1600	210	61		200	55	1500
1700	(220)	60		230	50	1600
1800	230	43		230	45	1700
1900	230	48		230	40	1800
2000	230	40		230	28	1900
2100	220	30		250	25	2000
2200	220	25		230	22	2100
2300	220	24		200	24	2200
2400	210	19				2300
Max. mean over any 60 min. over any 10 min.	(40) (44)		(See para. 13 of main text)			

NOTE: KILKEEL data is based on eye observations of the dials of a cup-generator anemometer, and the mean refers to a period of a few minutes before the time shown (in the right-hand time margin). The gust values reported as seen by a non-continuous watch.

TABLE II

contd.

MALIN HEAD

CLONES

Period ended at (GMT)	Mean 10-minutes o kt.	Max. Gust in 60-minute period. kt.	Remarks on gusts, &c.	Mean 10-minutes o kt.	Max. Gust in 60-minute period. kt.	Remarks on gusts, &c.	(GMT)
0100	080	14	Up to 0800 GMT gusts were generally to 20-25 kt, with isolated ones to 30kt approx. Wind increased 0800-0900 GMT gust values increasing to around 45 kt, and, during next two hours to 65+kt. Between 1100 and 1400 GMT gusts 70+kt. Max. gust 87kt. at 1250. After 1200, mean speed and gusts slowly fell to a mean of around 18kt. with gusts to 23-28kt. by 2000 GMT.	130	13	N.B. Mean speeds for period ending 0100, and for periods 0600-1000 GMT estimated, vane "windmilling". Steady increase in wind from 1000 to 1400 GMT (mean from 22kt. to 63kt., gusts from 35kt. to 90+kt.) After 1600 GMT wind decreased from mean 61kt. (gusts 90+kt) to mean around 30kt. (gusts 45-50kt) by 2100 GMT, falling a little more towards midnight.	0100
0200	160	24		090	14		0200
0300	150	33		065	22		0300
0400	140	27		075	26		0400
0500	135	28		090	25		0500
0600	115	33		110	26		0600
0700	125	22		130	26		0700
0800	130	27		130	41		0800
0900	150	41		130	33		0900
1000	160	50		140	?		1000
1100	180	77		165	49		1100
1200	190	79		180	89		1200
1300	195	87		185	92		1300
1400	200	84		200	96		1400
1500	205	77		200	96		1500
1600	215	72		205	98		1600
1700	220	63		220	94		1700
1800	220	57		230	79		1800
1900	220	47		245	73		1900
2000	205	38		240	53		2000
2100	205	32		230	50		2100
2200	210	31		225	43		2200
2300	200	24		230	36		2300
2400	200	27		225	37		2400
Max. mean over any 60 min. over any 10 min.		47 50		64 66			

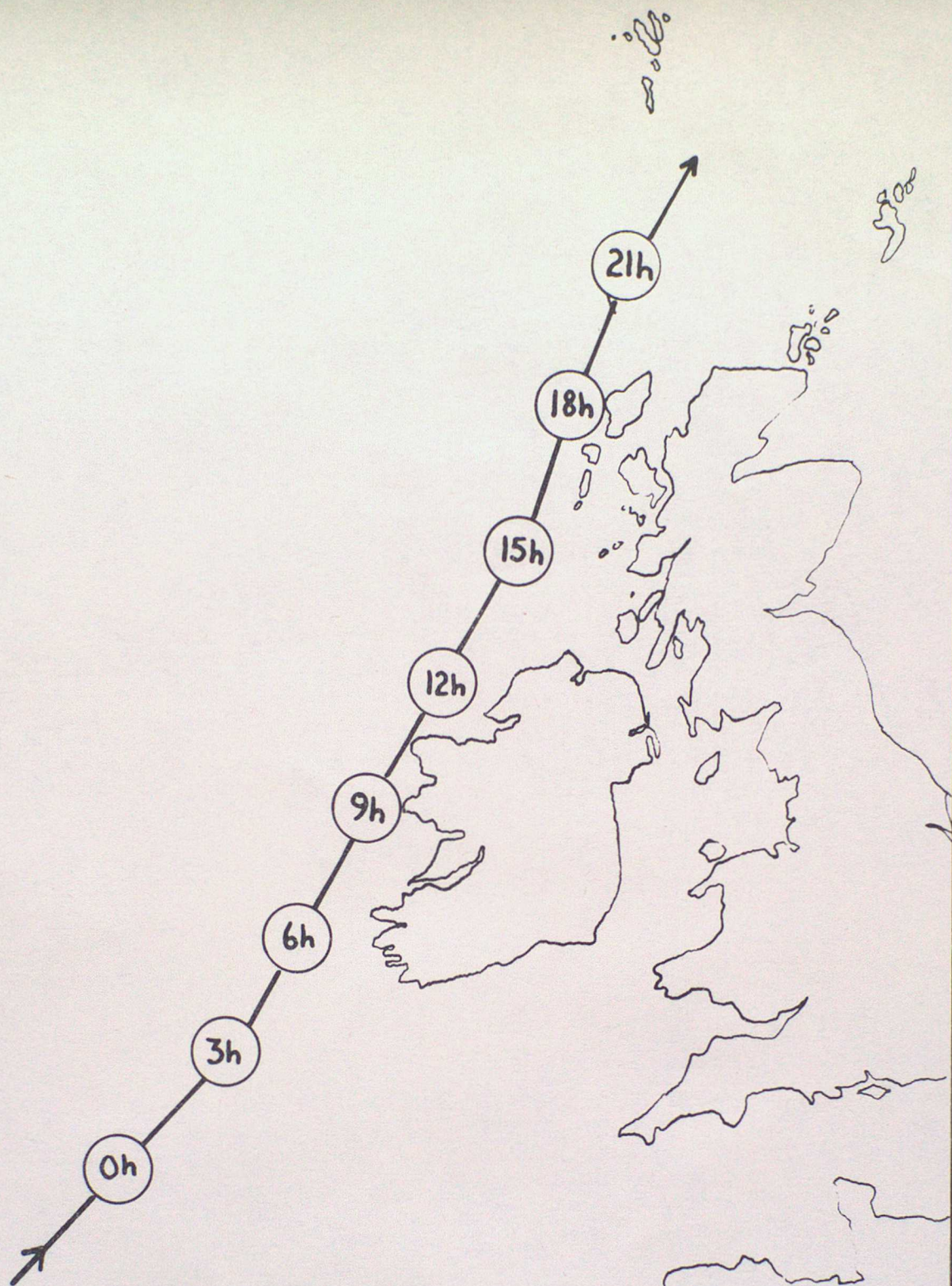
TABLE II
contd.

Period ended at GMT	BRIMMULLET			BIRR			CLAREMORRIS			DUBLIN AIRPORT			MULLINGAR		
	10-min. mean o	kt.	Max. gust 60 mins. kt.	10-min. mean o	kt.	Max. gust 60-mins. kt.	10-min. mean o	kt.	Max. gust 60-mins. kt.	10-min. mean o	kt.	Max. gust 60-mins. kt.	10-min. mean o	kt.	Max. gust 60-mins. kt.
0100	080	8	14	165	17	29	060	12	17	165	16	26	195	16	31
0200	060	12	19	165	14	29	075	6	16	170	14	27	185	16	30
0300	065	12	21	145	14	26	135	6	17	175	12	28	185	13	29
0400	060	18	28	145	15	29	140	9	15	160	15	27	170	17	28
0500	060	20	28	150	17	34	120	12	19	150	15	27	165	16	27
0600	055	11	26	150	21	37	110	11	26	150	19	32	165	13	29
0700	080	15	25	155	21	42	120	18	30	155	17	32	175	14	29
0800	120	19	31	170	33	56	140	22	41	165	17	32	190	29	51
0900	120	17	33	165	37	62	155	24	52	180	22	44	205	27	53
1000	145	22	42	185	38	73	170	38	61	200	27	50	210	33	64
1100	160	25	40	200	37	81	190	46	82	215	34	64	220	44	79
1200	205	28	40	215	33	71	210	57	86	220	34	61	235	34	71
1300	220	26	42	220	28	70	220	55	91	225	33	61	240	34	69
1400	245	51	74	225	28	57	235	40	83	230	30	60	240	32	59
1500	255	43	80	230	28	50	235	31	61	240	29	53	245	31	59
1600	245	36	64	235	28	47	240	25	48	240	31	51	250	25	57
1700	240	35	57	235	23	50	240	18	38	245	26	50	255	29	46
1800	235	29	48	225	18	36	230	13	30	250	23	47	260	20	42
1900	235	26	46	215	10	28	225	13	25	235	20	36	265	21	41
2000	225	26	37	210	8	21	220	15	23	225	10	29	240	12	27
2100	225	24	37	170	4	14	210	8	17	210	13	26	235	9	25
2200	225	23	35	185	7	11	210	11	17	215	13	25	230	8	17
2300	225	18	34	190	10	16	210	8	15	220	14	25	205	6	13
2400	225	18	38	190	8	17	210	9	12	220	11	12	210	6	13
Max. Mean any 60 min. any 10 min. Max. Gust time		51 57	80 1425	38 39		81 1055	56 60		91 1250	34 34		64 1045	41 45		79 1025

TABLE II
contd.

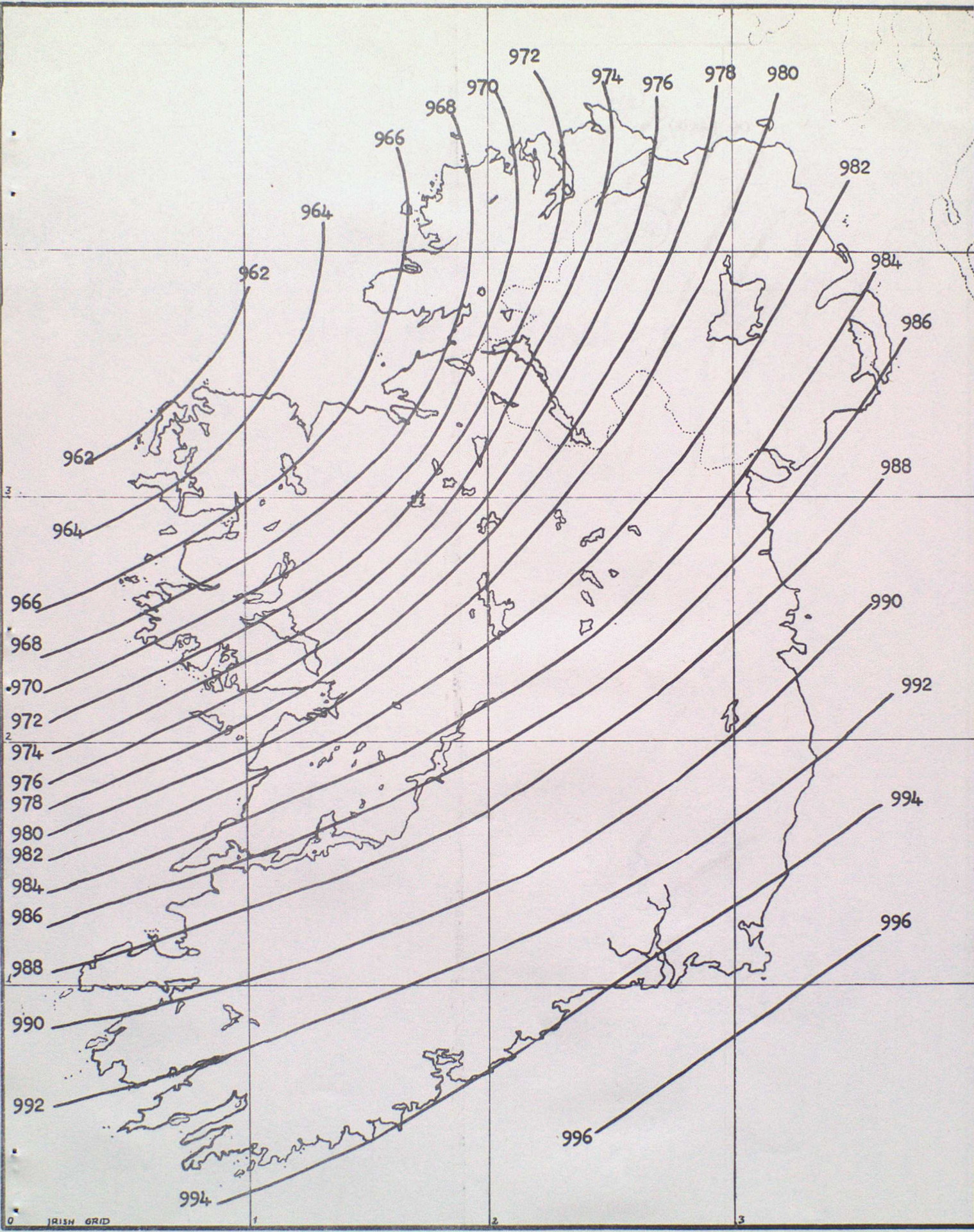
10.

Period ended at (GMT)	GLENAMOIY			KILKENNY			ROCHE'S POINT			ROSSLAKE			SHANNON AIRPORT			VALENTIA OBSY.		
	10-min. mean °	kt.	Max. gust 60-mins. kt.	10-min. mean °	kt.	Max. gust 60-mins. kt.	10-min. mean °	kt.	Max. gust 60-mins. kt.	10-min. mean °	kt.	Max. gust 60-mins. kt.	10-min. mean °	kt.	Max. gust 60-mins. kt.	10-min. mean °	kt.	Max. gust 60-mins. kt.
0100	060	5	12	170	16	37	120	27	41	175	26	37	160	19	28	160	16	33
0200	060	9	13	160	17	30	110	25	39	170	21	?	150	15	29	150	19	39
0300	055	9	18	160	19	31	105	22	40	170	25	39	135	14	24	140	25	43
0400	055	13	22	155	22	37	105	25	43	165	25	44	135	13	25	135	25	52
0500	050	12	23	150	20	42	115	39	54	165	28	41	130	20	32	140	32	60
0600	060	11	22	165	27	45	120	40	56	170	28	44	145	27	46	145	32	61
0700	105	18	28	160	31	50	145	45	63	170	33	49	160	40	62	140	31	59
0800	125	26	41	180	37	56	160	45	68	190	39	57	155	43	64	180	26	57
0900	110	39	56	185	36	64	175	50	71	200	46	72	165	53	76	230	58	85
1000	145	32	49	200	37	62	190	43	71	210	41	64	215	60	93	240	42	88
1100	150	32	60	200	38	65	190	42	64	210	38	64	220	50	85	245	35	61
1200	190	31	46	205	30	59	210	39	57	215	35	56	220	46	76	255	35	57
1300	210	30	49	210	33	58	210	33	57	215	35	53	230	44	69	250	29	52
1400	240	52	75	225	26	53	210	35	50	220	33	51	240	40	59	240	24	42
1500	250	49	85	230	27	49	200	29	45	220	28	51	250	38	55	230	21	34
1600	250	37	62	220	25	41	200	27	43	220	27	47	250	29	54	240	19	37
1700	240	32	56	215	19	42	195	25	40	215	25	45	230	24	39	235	16	28
1800	230	25	45	210	14	32	190	23	35	215	23	39	230	18	38	230	12	21
1900	235	27	42	205	8	22	190	17	31	215	17	39	210	15	26	195	9	21
2000	240	23	41	210	4	12	195	13	23	210	17	32	195	12	23	195	10	16
2100	230	20	34	160	3	7	185	14	18	210	14	28	195	14	18	175	7	22
2200	220	18	33	230	2	8	195	10	18	210	12	22	195	12	20	180	10	23
2300	230	15	35	200	6	9	200	8	13	210	11	20	180	11	16	170	9	16
2400	255	13	26	240	5	9	195	6	10	220	11	23	155	7	16	180	9	14
Max. mean any 60 minutes any 10 minutes		53 60		36 40		65 1025		50 52	71 0902	43 47		72 0850		53 60		52 58		88 0901
Max. gust Time			85 1423												93 0941			



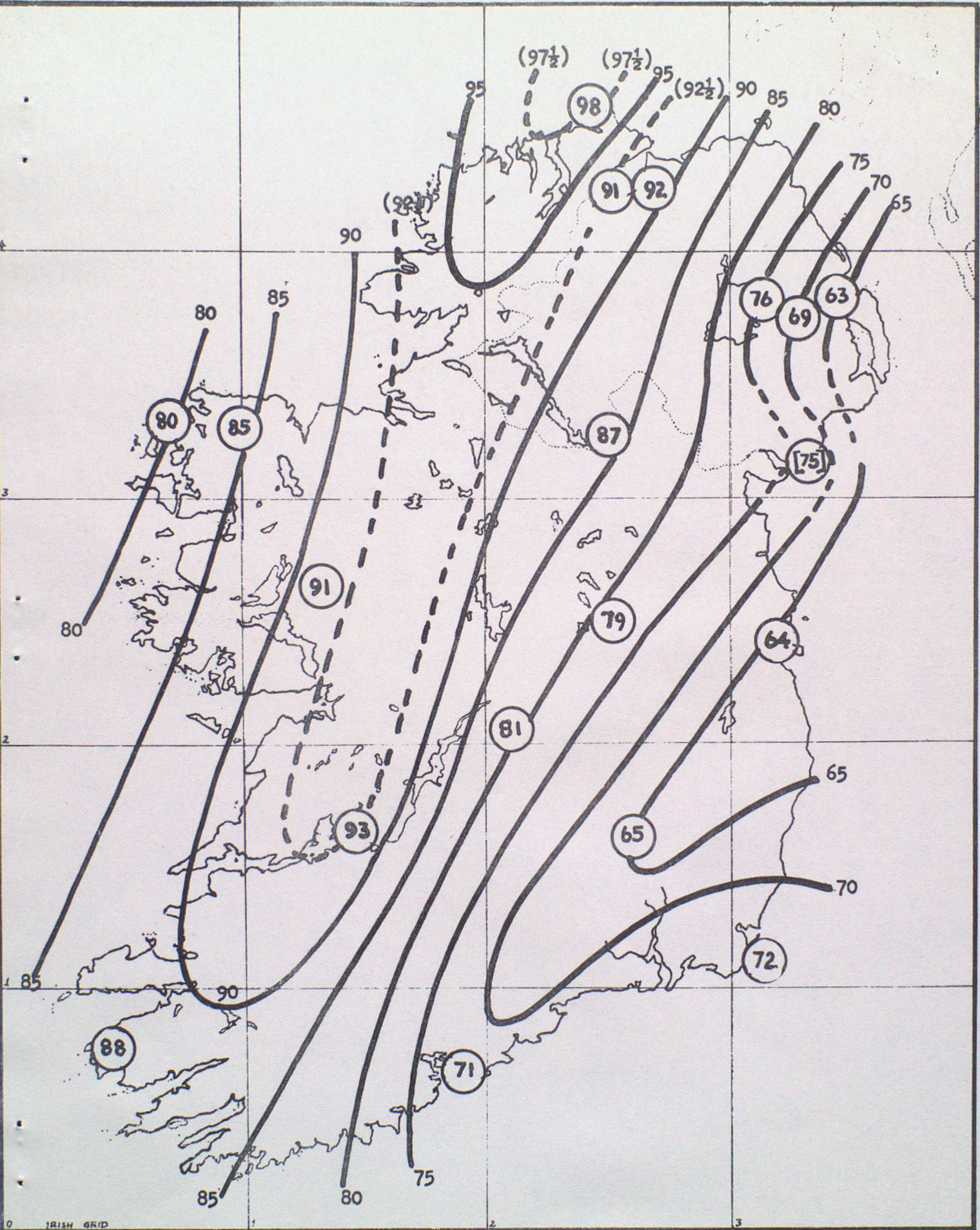
TRACK OF DEPRESSION
THROUGHOUT SATURDAY,
16TH. SEPTEMBER 1961.

Fig. 2 Isobar pattern at 12h G.M.T. (2 mb. intervals)



SCALE 0 10 20 30 40 50 Statute Miles

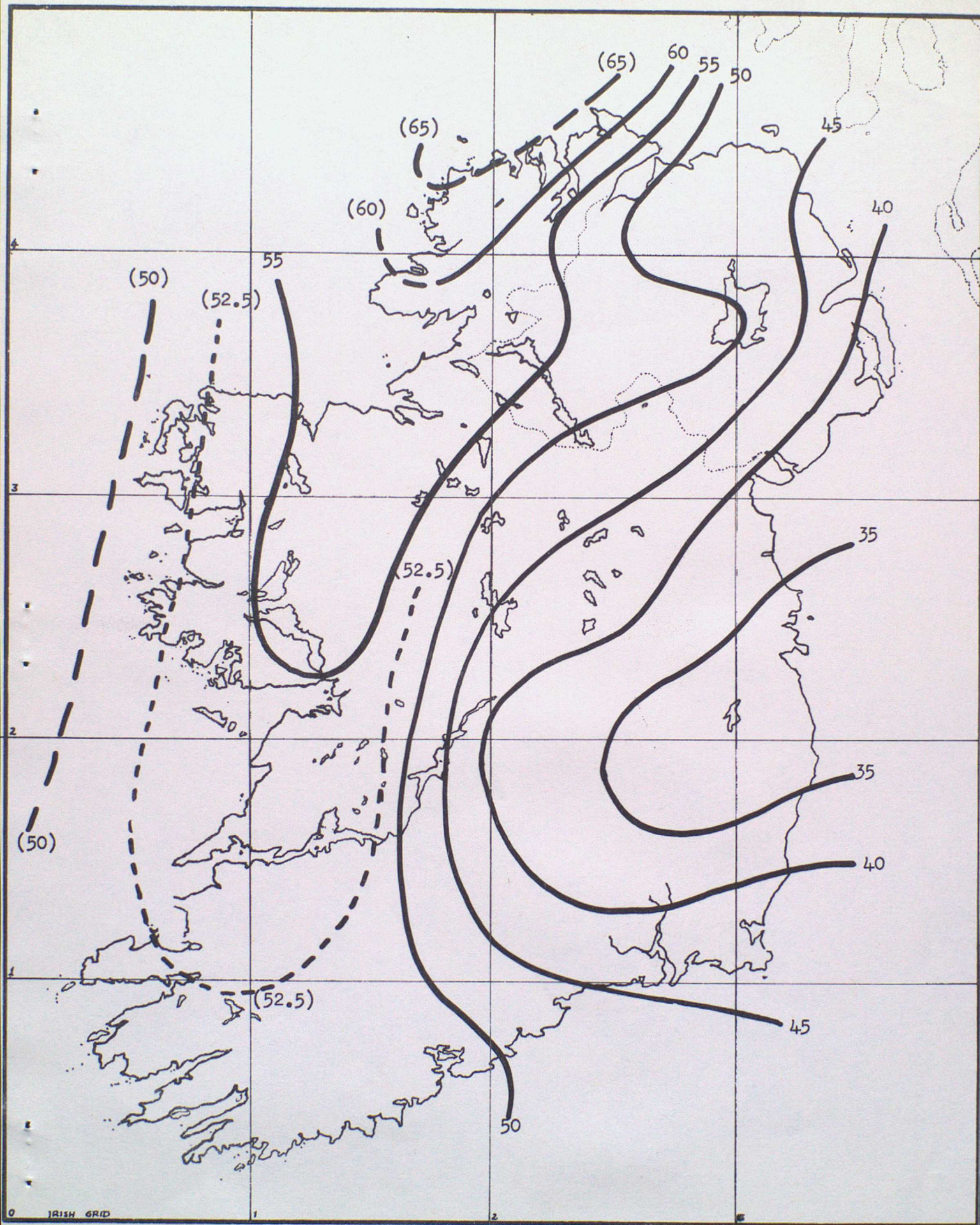
Fig. 3 Actual maximum gust recorded by anemographs* (knots)



* The value for Kilkeel (75) was from eye observations of a cup-generator anemometer indicating wind speed on a dial: no chart record is available.

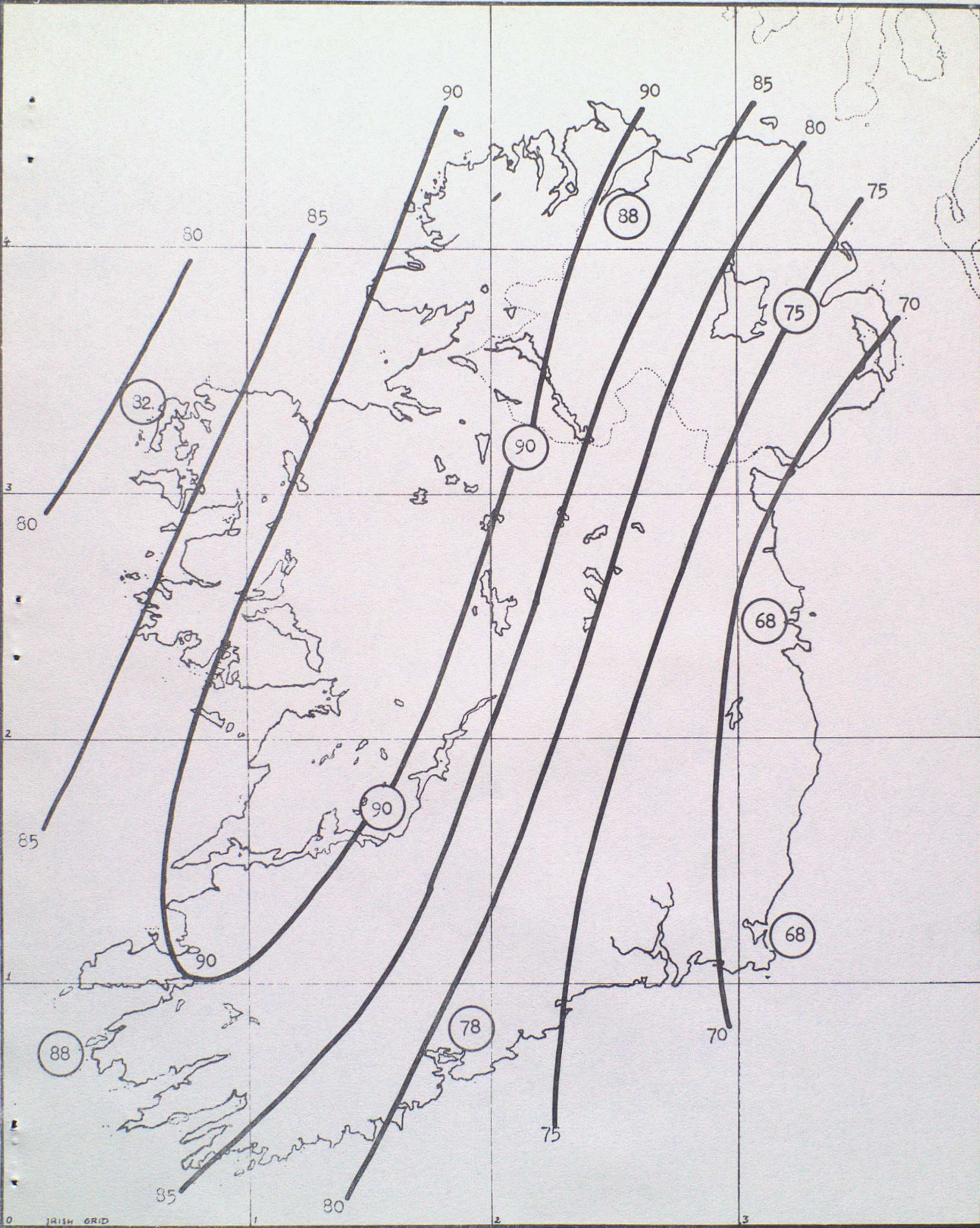
SCALE 0 10 20 30 40 50 Statute Miles

Fig.4 Maximum mean wind speed over any 60-minutes (knots)



SCALE 0 10 20 30 40 50 Statute Miles

Fig.5 Computed maximum gradient wind speed (knots)



SCALE 0 10 20 30 40 50 Statute Miles